

REMARKS

Applicant thanks the Examiner for the thorough examination of the application. Claims 1-12 are pending in the application. Claims 2-4 and 12 are withdrawn from consideration. Claim 13 is canceled. Independent claims 1, 5, and 11 are amended. Reconsideration of the present application, as amended, is respectfully requested.

Drawings

Included with the accompanying Letter to the Official Draftsperson is a proposed change to FIG. 4 showing how the wire loop 122 is wound around the hollow tubes 102 and satellite tubes 104. Upon approval, this change will be incorporated into the formal drawings which, according to the Office Action, are accepted.

Claim for Priority

Applicant's claim for domestic priority is acknowledged.

Objection to Specification

The specification is objected to as containing informalities and is amended herein to correctly indicate reference numerals 104 and 106 and to provide the missing words on pages 7-9.

Accordingly, withdrawal of the objection to the specification is respectfully requested.

Rejection under 35 U.S.C. §112, first paragraph

Claims 1, 5-11, and 13 are rejected under 35 U.S.C. §112, first paragraph, for lack of enablement. Applicant respectfully traverses this rejection.

FIG. 4 and the specification are amended to show how the wire loops are wound about the hollow tubes 102 and satellite tubes 104. Accordingly, withdrawal of the rejection under 35 U.S.C. §112, first paragraph, is respectfully requested.

Rejection under 35 U.S.C. §102(b)

Claims 1-3 and 5 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,472,939 to Wang. Applicant respectfully traverses this rejection.

While not conceding the appropriateness of the rejection, but merely to advance prosecution of the instant application, independent claims 1 and 5 are amended to recite combinations of elements in a device for generating a torque and an engine, respectively, including a wire loop that has been trained in accordance with shape memory effect principles to asymmetrically deform by extending one side of the wire loop laterally in a

direction away from the other side of the wire loop when locally heated.

Independent claim 11 is amended to recite a method for generating torque, including creating asymmetric circumferential deformation in the wire loop by feeding thermal energy through the central tube so as to activate the shape memory effect in each wire loop to extend one side of the wire loop laterally in a direction away from the other side of the wire loop, and that a torque on the respective tubes is generated by the asymmetric deformation and causes the pair of endplates and plurality of satellite tubes to rotate about the central tube.

In contrast to Applicant's claimed invention, Wang merely shows a thermal-mechanical energy device 10 having a fixed cylinder or wheel 12 having a cooler rotatably mounted wheel 14 orbiting the cylinder 12. As shown in FIG. 2, a memory effect material transmission element 16 drivingly connects the cylinder 12 with the wheel 14. The transmission element 16 is bent as it extends about a portion of the circumference of the cylinder 12. As heat is applied to the transmission element 16, it tends to straighten out by unbending with the release of a mechanical force.

Wang does not teach or suggest a wire loop trained in accordance with shape memory effect principles to extend one side of the wire loop laterally in a direction away from the other side of

the wire loop when heated, as required by the presently claimed invention.

It is respectfully submitted that the combinations of elements set forth in amended independent claims 1, 5, and 11 are not anticipated or made obvious by the prior art of record, including Wang, and that independent claims 1, 5, and 11, and the claims dependent therefrom, are in condition for allowance. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. §102(b) are respectfully requested.

Conclusion

All the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. It is believed that a full and complete response has been made to the outstanding Office Action, and that the present application is in condition for allowance.

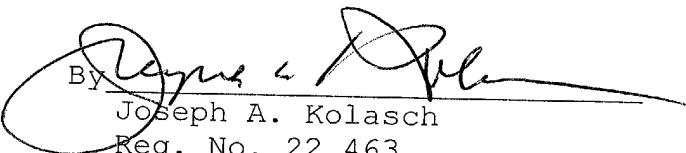
If the Examiner has any questions concerning this application, he is invited to telephone Sam Bhattacharya (Reg. No. 48,107) at (703) 205-8000 in an effort to expedite prosecution.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or to credit any overpayment to Deposit Account No. 02-2448 for any additional fees

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required under 37 C.F.R. §§ 1.16 or 1.17, particularly extension of
time fees.

Respectfully submitted,
BIRCH, STEWART, KOLASCH & BIRCH, LLP

By 
Joseph A. Kolasch
Reg. No. 22,463

3460-103P
Attachments
JAK:SB:rk
SB

P. O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

MARKED-UP COPY OF AMENDMENTS

In the Specification:

Please amend the paragraph beginning on page 5, line 12, and ending on page 6, line 2, as follows:

In general, the assembly includes a support 100 supporting opposite ends of a hollow central tube 102. A plurality of satellite tubes 104 are mounted at respective ends thereof on a pair of end plates 106. For example, five pairs of diametrically disposed satellite tubes 104 may be provided, as illustrated in Figures 1 and 2, although a different number of satellite tubes may be provided in a variety of relative arrangements according to the present invention. Central tube 102 passes through both end plates 106 so that the satellite tubes [106] 104 mounted on end plates [104] 106 are rotatable about central tube 102. If desirable, a conventional friction-reducing mechanism may be provided to facilitate the rotation of the end plates 104 about central tube 102, such as ball bearings or the like. However, satellite tubes [106] 104 are preferably static relative to end plates [106] 104 (i.e., satellite tubes [106] 104 preferably do not rotate about their respective axes).

Please **amend the paragraph beginning on page 6, line 3, as follows:**

Each satellite tube [106] 104 may be mounted relative to end plates [104] 106 using screws 108, passed through slots 110 formed in each end plate [104] 106. Respective slots 110 in the end plates [104] 106 are preferably aligned with one another so as to extend radially outward from the central tube 102, such that a respective satellite tube [106] 104 can be fixed at different radial distances from the central tube 102. Screws 108 may be of any known form, including a finger-tightened screw as shown in Figures 1 and 2.

Please **delete the paragraph beginning on page 7, line 1, and insert therefor:**

-- As mentioned above, the assembly may carry a plurality of oppositely poled magnet pairs 114 mounted thereon (for example, fastened onto end plates 106 by means of fastener holes 112). For example, magnets 114 may be attached to endplates 106 at locations between respective satellite tubes 104. See Figure 3. When the assembly of satellite tubes 104 mounted on end plates 106 is rotated with magnets 114 mounted thereon, the assembly can be used as a rotor of an electrical generator. --

Please delete the paragraph beginning on page 7, line 20, and ending on page 8, line 4, and insert therefor:

-- As mentioned above, at least one wire, made from a shape-memory effect material such as nitinol, is looped about the central tube 102 and each respective satellite tube 104. Usually, a plurality of such wires are looped about the central tube 102 and each satellite tube 104. Each loop is, for example, a length of wire having its ends joined to each other in any conventional manner. One method of joining the ends is to use a laser to make a spot weld. Most preferably, the ends of the wire are joined so as to not cause any discontinuities in the shape memory effect along the length of the loop. --

Please delete the paragraph beginning on page 8, line 21, and ending on page 9, line 7, and insert therefor:

-- The asymmetric deformation illustrated in Figure 4 imparts a tangential component of force on a respective satellite tube 104 in the direction of the deformation (the central tube 102 being essentially fixed). In the case illustrated in Figure 4, for example, a tangential force to the left (with respect to the drawing) would be applied to the respective satellite tube 104. The sum of such tangential forces over all of the wire loops used

is sufficient to cause the endplates 106 and satellite tubes 104 (and the magnets 114, if provided) to rotate about the central tube 102. The radial distance between a satellite tube 104 and central tube 102 may be altered so as to control the torque applied to the assembly, and, in turn, the speed at which the assembly rotates about the central tube 102. --

In the Claims:

Please **cancel claim 13** without prejudice or disclaimer.

Please **amend claims 1, 5, and 11** as follows:

1. (Amended) A device for generating a torque, comprising:
a hollow central tube;
a pair of endplates mounted on said central tube, such that said pair of endplates are rotatable about said central tube;
a plurality of elongate members extending between said pair of endplates and radially spaced apart from said central tube, such that said plurality of elongate members are rotatable about said central tube along with said pair of endplates; and
at least one wire loop made from a shape memory effect material wound about said central tube and each of said plurality of elongate members, said wire loop having been trained in accordance with shape

memory effect principles to asymmetrically deform by extending one side of the wire loop laterally in a direction away from the other side of the wire loop when locally heated, each of said wire loops being oriented so said asymmetric deformation occurs in the same direction.

5. (Amended) An engine comprising:

a central tube;

a pair of endplates mounted on said central tube;

at least one elongated member extending between said pair of endplates;

at least one wire loop around the central tube and said elongated member, said wire loop including a shape memory effect material and having been trained in accordance with shape memory effect principles to asymmetrically deform by extending one side of the wire loop laterally in a direction away from the other side of the wire loop when locally heated.

11. (Amended) A method for generating torque comprising:

rotatably mounting a pair of endplates about a central tube;

providing a plurality of satellite tubes extending between the endplates such that the endplates and the satellite tubes are rotatable about the central tube;

looping wire including a shape memory effect material about the central tube and each satellite tube of the plurality of satellite tubes; and

creating asymmetric circumferential deformation in the wire loop by feeding thermal energy through the central tube so as to activate the shape memory effect in each wire loop to extend one side of the wire loop laterally in a direction away from the other side of the wire loop,

wherein a torque on the respective tubes is generated by the asymmetric deformation and causes the pair of endplates and plurality of satellite tubes to rotate about the central tube.